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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/526,550	10/14/2005	Koji Tamai	038788.55987US	9222

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EXAMINER
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LAZORCIK, JASON L

ART UNIT	PAPER NUMBER
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1791

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/526,550	<b>Applicant(s)</b> TAMAI ET AL.	
	<b>Examiner</b> JASON L. LAZORCIK	<b>Art Unit</b> 1791	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 August 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/4/2009</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### **Status of the Claims**

Applicants reply dated August 4, 2009 amends independent claim 1, and cancels claims 2 and 4-9.

In view of the instant reply, claims 2 and 4-9 stand as cancelled by Applicant and no claims remain withdrawn from consideration. Therefore, claims 1 and 3 are pending for prosecution on the merits.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kajii (US 6,412,309) in view of Yaga et. al. (Yaga et. al., "Experimental and**

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**Three-Dimensional Numerical Study on Under-Expanded Impinging Jets”, Journal of Thermal Science, Vol. 9, N. 4, (2000), pp.316-321) and Melling (US 3,776,709)**

With respect to Claim 1, Kajii et al. disclose a glass quenching apparatus for producing thermally tempered glass produced by allowing impact jet flow from quenching nozzles to blow against glass surfaces (Abstract). The process is used to produce thin, curved, thermally tempered glass (Col. 10, lines 59-65) using the above jet flow. The reference discloses throughout that a quenching step is conducted by simultaneously using two types of quenching nozzles (37/27 and 78/79 in the Figures) wherein it is illustrated that the nozzles have differing exit diameters (see Figures).

As noted in the prior Official Action, Kajii et al. discloses the outside diameter  $d$  of the second nozzle 78 as measured at the lower end 78b is in the range of 1.0 to 2.0 mm (Column 8 lines 28-32, Figure 6). Although Kajii et al. do not explicitly disclose the exit diameters of nozzles 37/27, it can be concluded from Figures 5 & 12 that the diameter of nozzles 37/27 is approximately 1.5 to 2 times the diameter of second nozzles 79/78, making the diameter of nozzles 37/27 about 1.5 to 4 mm. Therefore the quenching nozzles of Kajii are construed to be of at least two types having different exit diameters wherein the exit diameters are construed to be within the range of 1mm to 8mm as recited in claim 1.

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(I) Kajii is silent regarding operation of the quench using “under expansion jet flow” conditions, the operating pressure of the quench head, or the nozzle to sheet spacings as recited in claim 1.

As noted above, Kajii teaches a tempering operation for thin glass sheets having thickness values ranging from approximately 1.5mm to 3mm thick (Col. 1, lines 36-42). Kajii further recognizes that achieving a requisite degree of tempering in thin sheets is challenging due to difficulties in generating a sufficient thermal gradient between the sheet surface and the interior of the sheet. These challenges for tempering thin glass sheets are widely recognized to skilled practitioners in the glass manufacturing arts.

Kajii is silent regarding operation of the quench under “underexpansion jet flow” conditions or the pressures and nozzle spacings as required by claim 1.

(II) Operating under “underexpansion jet flow” conditions would have been obvious in view of the reference to Yaga et. al. (Yaga et. al., “Experimental and Three-Dimensional Numerical Study on Under-Expanded Impinging Jets”, Journal of Thermal Science, Vol. 9, N. 4, (2000), pp.316-321).

Yaga teaches that enhanced cooling effects can be achieved in substrate cooling operations by operating the cooling jets under under-expanded conditions (see page 316, Introduction). Specifically, Yaga demonstrates that underexpansion flow conditions provide a cooling effect which is enhanced to a level which is greater than would

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normally be expected based upon a given quench air discharge temperature (see figure 3). Yaga further teaches that the decrease in temperature at the substrate level is at least partially attributed to beneficial flow patterns imparted to the quenching fluid when jetted against the substrate under underexpansion conditions.

One skilled in the art at the time would have been motivated to tailor the Kajii process to operate under the “underexpansion jet flow” conditions as noted by Yaga as a means to enhance the efficiency of the glass sheet quenching operation.

With respect to the particular process conditions used to achieve underexpanded flow, Yaga further teaches that underexpansion conditions may be achieved using nozzles having approximately the same diameter as employed by Kajii above, namely approximately 5 to 10mm diameter, and using high pressure air at 0.7MPa discharged to atmospheric pressure. Yaga further instructs that the jet nozzles should be separated from the target surface by a distance L according to L/D ratios of between 2-4. For the Kajii sized nozzles the Yaga disclosed separations distances would correspond to distances between 1 to 16 mm.

In short, the Yaga teachings applied to the Kajii disclosed process yields underexpansion operating parameters, namely quenching nozzle exit diameters, nozzle glass separations distances, and chamber pressures, which read upon the operating parameters as cited in claim 1, lines 9-12. Finally, Yaga notes that the underexpansion effect responds in a predictable fashion dependent upon a chosen pressure ratio, nozzle-to-plate distance, and also upon the nozzle types. It follows, in view of Yaga,

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that a skilled technician in the arts equipped with the Yaga disclosure would have been able to achieve underexpanded flow through no more than routine experimentation and optimization of the quench process operating conditions, namely quench pressure and nozzle-substrate separation distances.

(III) The cited prior art to Yaga and Kajii are silent regarding the compression stress difference of 20MPa or less

As noted above, Kajii and Yaga teach every element of Applicants recited invention including the process of glass sheet quenching using underexpanded flow conditions. The prior art of record is however silent regarding the limitation requiring a surface compression stress difference of 20MPa or less for the quenched glass sheet.

(IV) Applicants recited surface compressive stress would have been obvious in view of Kajii and Yaga and further in view of Melling (US 3,776,709)

Melling discloses a method for quenching a thin glass sheet in the range of 1.8mm to 4mm thick which one skilled in the art would find as closely related to the Kajii process discussed above. Melling teaches (col. 6, lines 14-20) that to achieve an adequate state of temper in a thin glass sheet, the heat transfer coefficient of the quench should be controlled to between 0.006 to 0.02 calories / cm<sup>2</sup>\*°C\*sec. One skilled in the art would find it obvious to maintain the heat transfer coefficient of the Kajii

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quench to within the parameters disclosed by Melling where such conditions have been demonstrated as effective to quench glass sheets in the thickness range of the Kajii sheets.

The Melling disclosed heat transfer coefficient falls well below the threshold  $150\text{kW/m}^2$  value disclosed in the application Specification (see Specification paragraph [0037-30038]), which threshold value Applicant notes to yield surface compressive stress values of 20 MPa or less. It is therefore the Examiners assessment that a thin glass sheet having a thickness in the range of the Kajii disclosed thickness and quenched according to the Melling heat transfer quench conditions would yield surface compressive stress differences of 20MPa or less as recited in claim 1. Alternately, it is the Examiners assessment that a relatively uniform surface compressive stress (e.g. surface compressive stress differences of 20MPa or less) would have reasonably been achieved through routine process optimization and quality control measures for the process as taught by Kajii in view of Melling.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1 and 3 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON L. LAZORCIK whose telephone number is (571)272-2217. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jason L Lazorcik/  
Primary Examiner, Art Unit 1791